

Smart E-dustbin

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Abstract— as the second most populous country in the world India face a major problem in waste management. As of now there are traditional waste management systems like periodic and routine clearing by the various civic bodies like the municipal corporation. But even though these routine maintenances is carried out we often come across overflowing garbage bins from which the garbage spills on to the streets. The smart city concept is still new in India, although it has received a lot of attention in few years when our present prime minister gave the idea of building 100 smart cities throughout India. Now, with the upcoming large number of smart cities, large numbers of responsibilities are also required to be fulfilled. The prime need of a smart lifestyle begins with cleanliness and cleanliness begins with dustbin. A society will get its waste dispatched properly only if the dustbins are placed well and collected well. The main problem in the current waste management system in most of the Indian cities is the unhealthy status of dustbins. In this paper we have tried to upgrade trivial and vital component of the urban waste management system, i.e. dustbin. The basic Idea behind project is to implement a smart way of handling the garbage in a smart way which is done by using the IOT protocol for transmitting the dustbin status wirelessly, which can generate e-mail to notify to the concerned person that system is filled with garbage and need to be replaced We have selected the Espresso chip which is a node MCU ESP8266 platform. The ultrasonic sensor will show the level of garbage filled in dustbin, whereas the proximity sensors will detect the obstacle present in front of dustbin to avoid collision. LCD interfacing has been done to show the current situation of dustbin.

Keywords— moving dustbin, ultrasonic, Wi-Fi module, object detection

I. INTRODUCTION

In India the traditional waste management system is collecting and clearing garbage regularly and periodically by the municipal corporation or competitive authority. This system will be more effective and non-hazardous with the municipal people when no toxic material will be in contact with them. A society will get its waste dispatched properly only if the dustbins are placed and emptied properly.

If the wastes is not managed properly then there is a mass production of bacteria, insects which finally spread different diseases. Thus the normal life of a human being gets affected because of unhealthy environment. Cleanliness is very important and for a smart city and hence we have designed a smart and moving dustbin. In this paper we have tried to upgrade the trivial but vital component of the urban waste management system, i.e. dustbin. This Smart E- Dustbin [1] visits different locations and people can put the garbage in the dustbin. The path in which it will move can be preloaded in the device or it follows the line using concept of line follower and obstacle detector robot. The dustbin checks whether it is full and sends an e-mail to the concern authority to make arrangement to empty it. The users are provided with different instructions and status on LCD display.

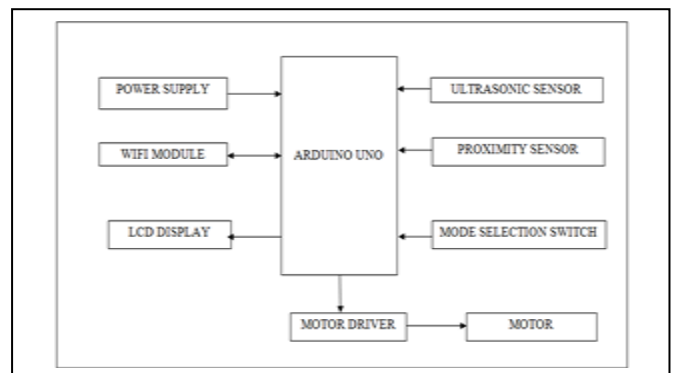


Fig. 1:- Block diagram of System

The working of the project is based on the Arduino platform. This microcontroller controls the movement of Smart E- Dustbin. This movement can be following a specific path defined by a line or the path can be pre-programmed in the device. The LCD display, Ultrasonic Sensor, Proximity Sensor, Wi-Fi module (ESP8266) and Motor Driver (L293D) are interfaced with Arduino Uno board. Different messages are displayed on LCD display. If someone wants to put the garbage in it, then the person can stop the dustbin by keeping

hand in front of it. The proximity Sensor detects obstacle and it stops the dustbin movement for 30 seconds.. The Ultrasonic sensor is connected at the top of dustbin. It is used to detect the level of garbage filled at any instance of time. If the dustbin is full, then message is displayed on LCD and also transfers the message through the Wi-Fi module to the server. This will send an email to concern authority with the identification number of dustbin. The controller used is Arduino Uno. It collects information from proximity sensor, ultrasonic sensor and also controls movement of dustbin. It is also connected to the Wi-Fi module –ESP8266. This module transmits and receives data to web server. LCD will display the current mode of operation.

II. IMPLEMENTATION METHODOLOGY

The basic idea behind project is to implement the handling of the garbage in a smart way. The proposed idea of using the IOT protocol for transmitting the dustbin status by using wireless mode. We have selected the esp8266 platform for this purpose which is a node MCU ESP8266 platform.

Esp8266 is newly launched platform used by many users. It works on 2.4 GHz ISM band and hence is free. So it is very popular and also has power down mode which put esp8266 into power down when no Wi-Fi is available in range. Esp. 8266 detects the presence of Wi-Fi then it matches the SSID and PASSWORD and try to connect with the router or through Wi-Fi. Esp8266 acts as a host of network it assigns one IP which is displayed over the browser. Once we open the link using IP address the status of the dustbin is displayed over the browsers page as well as it send an email to the predefined user inside code. Arduino platform is based on atmega328p based AVR microcontroller. It is very popular for the heavy online software support. It is a 28 pin IC which is most suitable for the project as we need many GPIO connections. Also the arduino IDE is very user friendly it supports both programming for ESP8266 as well as Arduino UNO r3. We have interfaced 16X2 character LCD module, ultrasonic module HCSR04, IR sensor, and two way switch with the GPIO pins of Arduino. Arduino has many inbuilt functions which makes system development very easy and user-friendly. For checking our project on field it helped a lot as it has inbuilt programmer which programmers it within no time and also give runtime debugging via serial monitor.

According to the weight capacity of our dustbin we have selected the 12V 5KG 100RPM motors[12]. Motors are controlled with the help of L293d motor driver IC which can handle up to 5A current and up to 30V hence it is best suitable for our driving part. Based on binary values the L293d control the motors in forward, backward, left, right. We started with making of DNS server as client and using webpage for reception of data.

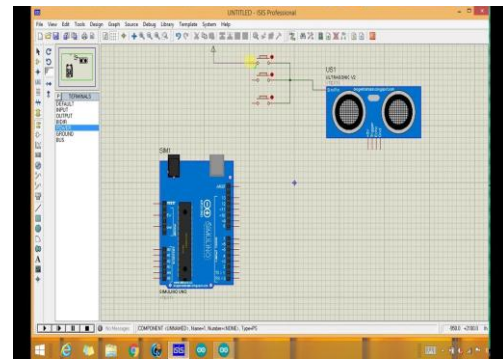


Fig. 2:-Simulation of interfacing of ultrasonic sensor

We program Arduino microcontroller in such a way that it will recognize different interrupts from sensors and display different project parameters.

Battery is very important component as it has to provide power to many components and also to motor. The motor specifications depends on size of dustbin. This smart garbage bins also exchange information with each other using wireless mesh networks, and a router and server collect and analyze the information for service provider. The system includes various IoT techniques considering user convenience. The battery power is optimized as power down mode is available. Hence it is energy-efficient device. The proposed system has been operated as a pilot project in Andheri area of Mumbai for one day. The experiment showed that the average amount of food waste could be reduced by 33%.

For displaying various messages and instructions to the user we have used 16x2 LCD that is to be displayed from the system.

One ultrasonic sensor is used to detect the height of the garbage inside the dustbin. We are measuring the garbage level in cm. So whenever the height of the garbage will be less than 10cm then it interrupts the esp8266. Wi-Fi module will be enabled. ESP load the information on the web server using the secured https link. Also the buzzer is turned on along with the alert message on LCD display. Dustbin is proposed to have movable platform so it is connected with motors and motors are controlled by the motor driver L293D. Motor driver is controlled using Arduino depending upon the interrupt generated by the front proximity sensor attached to the dustbin. Arduino is provided with many functions for different functionalities to handle different interrupts and taking respective actions accordingly. System works flawlessly along with all the sensors and movements of motors and web browser. We have designed two PCBs for the power supply section and motor driver section and finally we have installed all the modules along with main arduino board and sensors connected inside the dustbin.

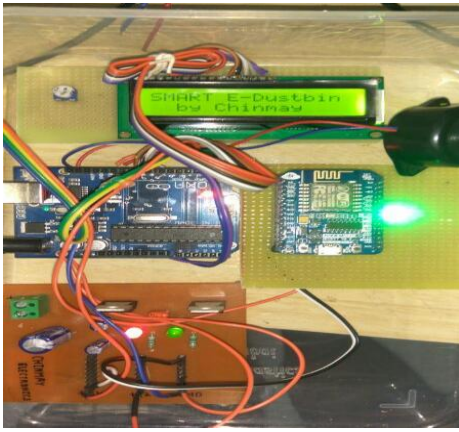


Fig. 3 :- Interfacing of each module with Arduino

III. OPERATION

Whole system is based upon an AVR microcontroller [7] which serves the purpose of taking the decisions based on the inputs as written inside the code. The purpose behind choosing a simple controller is that it is very cost effective and recurring cost (if any) then can be tolerated.

It uses smart low power Wi-Fi platform for communication with outside world, now a days Wi-Fi is much reliable communication way for long distance communication over internet. We have already studied GSM900A but its have almost 10 times more power consumption than the low power Wi-Fi module. Also some more layer of securities can be achieved over the Wi-Fi connection.

Wi-Fi module esp8266 is programmed with embedded c and some part of html language code which runs inside the esp. chip to maintain server working flawlessly.

Simply dustbin get initiated with saying welcome message and checks for all its parameters such as height of garbage via ultrasonic sensor, front ir sensor, motor status and Wi-Fi connectivity.

Once the Wi-Fi get connected and microcontroller ensure that dustbin is not full it will start moving based on either line follower mode or based on predefined programed path. For selection between the two modes we have one toggle switch connected to GPIO pins of Arduino [9].

IV. CONCLUSION.

In conclusion, to fulfil the luxurious needs of humans and to save time for the busy world and to give proper service to all without any delay was the main concern which we successfully implemented, this Smart E- Dustbin can be used at public places, educational institutes, corporate world, governmental offices and many more, which serves in user friendly manner and helps in maintaining the world clean and green.

V. FUTURE SCOPE.

In this project, implementation is done only for a single bin. Integration of many bins each with a unique ID can be done by implementing the principles of IOT [5] and creating database for each bin which can be maintained by using SQL technology and a login webpage is created to ensure authorized entries. One more modification can be done, that this dustbin may be user free, i.e. if the waste in the dustbin gets filled then it follows a path where it will dump all the waste. Apart from this, differentiation can be made between dry trash bin and wet trash bin collecting plastic dry waste and biodegradable waste respectively. GPS module can be interfaced to each dustbin which sends the status and location of the dustbin, which can be displayed on the GUI maintained by the respective authority of the city. Further the whole system can be made water resistant.

Once someone puts a hand in front of the dustbin it will initiate command to stop the dustbin first then it will display the various messages regarding putting garbage inside dustbin.

If garbage is full and still someone stops the dustbin it will display the message “garbage is full Thanks.”

If garbage is not full it will take the garbage from user wait for few seconds to ensure proper entry of garbage and then start moving based on which ever mode is selected.

Smart e dustbin has wide entry in parking zones, big corporate areas, hospitals, gardens and parks.

It was initially developed by SK robotics Bengaluru based company but due to some issues regarding its safety the project was not successful at that time.

After that many people tried to convince the government authority about publishing use of such robotics dustbins in park or garden areas.

VI. REFERENCES:

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